

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## A2CC Reflecting Parabolas

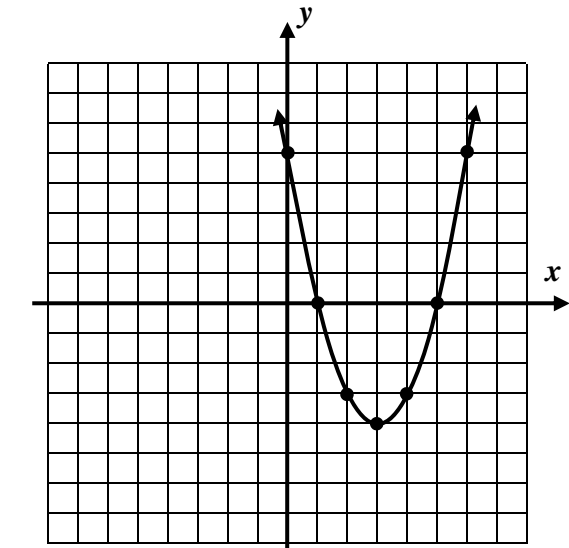
Reflecting functions across the  $x$  and  $y$  axes are an important mathematical processes that will be explored in this lesson specifically for parabolas, although the general ideas apply to all types of functions. The first exercise gets at both of these important transformations.

**Exercise #1:** The parabola  $f(x) = x^2 - 6x + 5$  is shown on the grid below.

(a) Consider the function  $g(x) = -f(x)$ . Determine a formula for  $g(x)$  and graph it on the grid below.

(b) How was the graph of  $f$  transformed to produce the graph of  $g$ ?

(c) Now consider the function  $h(x) = f(-x)$ . Determine a formula for  $h(x)$  and graph it on the grid above.



(d) How was the graph of  $f$  transformed to produce the graph of  $h$ ?

### REFLECTING FUNCTIONS IN THE $x$ AND $y$ AXES

The function  $-f(x)$  is a reflection of  $f(x)$  over the  $x$ -axis.

The function  $f(-x)$  is a reflection of  $f(x)$  over the  $y$ -axis.

**Exercise #2:** Determine an equation for the linear function  $g(x) = 5x - 7$  both after a reflection in the  $x$ -axis and  $y$ -axis. Label your equations.

**Exercise #3:** If a parabola has the equation  $f(x) = 2x^2 - 3x + 8$ , which of the following represents its equation after a reflection in the  $x$ -axis?

(1)  $y = 2x^2 + 3x + 8$       (3)  $y = -2x^2 + 3x + 8$

(2)  $y = -2x^2 + 3x - 8$       (4)  $y = 2x^2 - 3x - 8$

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**Exercise #4:** After a reflection in the  $y$ -axis, the quadratic function  $g(x) = 4x^2 - 7x + 2$  would have the equation

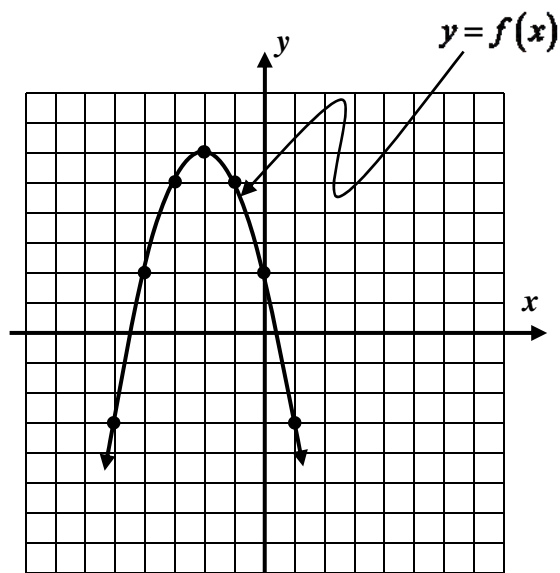
(1)  $y = -4x^2 + 7x + 2$       (3)  $y = 4x^2 + 7x + 2$

(2)  $y = -4x^2 + 7x - 2$       (4)  $y = 4x^2 + 7x - 2$

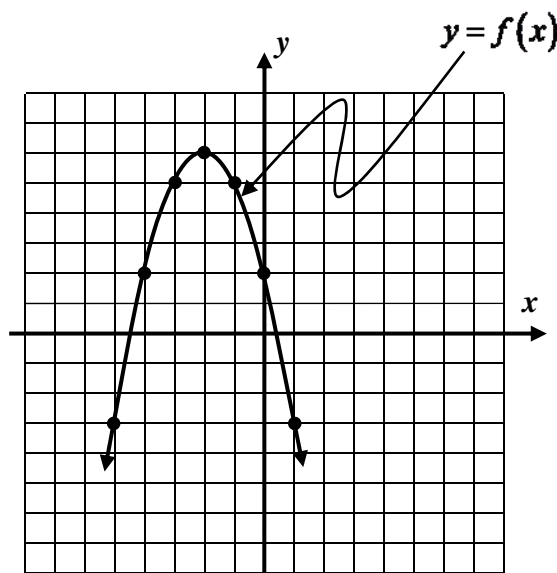
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**Exercise #5:** Consider the function  $g(x) = -x^2 + 4$ . What two transformations have occurred to the graph of  $y = x^2$  to produce the graph of  $g$ ? Specify the transformations and the order in which they occurred. Note that there exists more than one correct answer. Graph on your calculator to verify.

**Exercise #6:** The graph of a function  $f(x)$  is shown below on two grids. Sketch (a) the graph of  $-f(x)$  and (b) the graph of  $f(-x)$ .



(a) Graph and label  $-f(x)$ .



(b) Graph and label  $f(-x)$

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A2CC Reflecting Parabolas

**REFLECTING PARABOLAS**  
**COMMON CORE ALGEBRA II HOMEWORK**

**FLUENCY**

1. Which of the following equations would represent the graph of the parabola  $y = 3x^2 - 4x - 1$  after a reflection in the  $x$ -axis?

(1)  $y = -3x^2 - 4x - 1$

(3)  $y = 3x^2 + 4x - 1$

(2)  $y = -3x^2 + 4x - 1$

(4)  $y = -3x^2 + 4x + 1$

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2. The graph of  $y = 10 - x^2$  represents the graph of  $y = x^2$  after

(1) a vertical shift upwards of 10 units followed by a reflection in the  $x$ -axis.

(2) a reflection in the  $x$ -axis followed by a vertical shift of 10 units upward.

(3) a leftward shift of 10 units followed by a reflection in the  $y$ -axis.

(4) a reflection across the  $x$ -axis followed by a rightward shift of 10 units.

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3. If  $f(x) = -2x^2 + 5x - 3$  and  $g(x)$  is the reflection of  $f(x)$  across the  $y$ -axis, then an equation of  $g$  is which of the following?

(1)  $g(x) = -2x^2 - 5x - 3$

(3)  $g(x) = 2x^2 + 5x - 3$

(2)  $g(x) = -2x^2 + 5x + 3$

(4)  $g(x) = 2x^2 + 5x + 3$

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4. If the point  $(-3, -5)$  lies on the graph of a function  $h(x)$  then which of the following points *must* lie on the graph of the function  $-h(x)$ ?

(1)  $(3, 5)$

(3)  $(-5, -3)$

(2)  $(-3, 5)$

(4)  $(3, -5)$

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5. If the function  $y = -f(x - 4)$  were graphed, it would represent which of the following transformations to the graph of  $y = f(x)$ ?

(1) A rightward shift of 4 units followed by a reflection in the  $x$ -axis.

(2) A rightward shift of 4 units followed by a reflection in the  $y$ -axis.

(3) A downward shift of 4 units followed by a reflection in the  $x$ -axis.

(4) A leftward shift of 4 units followed by a reflection in the  $y$ -axis.

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6. After a reflection in the  $x$ -axis, the parabola  $y = x^2 - 4$  would have the equation

(1)  $y = x^2 + 4$                       (3)  $y = 4 - x^2$

(2)  $y = -x^2 - 4$                       (4)  $y = x^2 - 8$

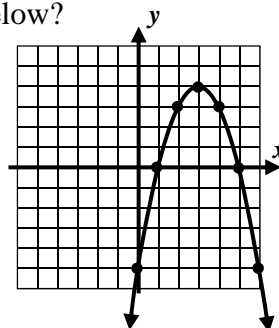
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7. Which of the following equations represents the graph shown below?

(1)  $y = (x + 3)^2 + 4$                       (3)  $y = -(x - 3)^2 + 4$

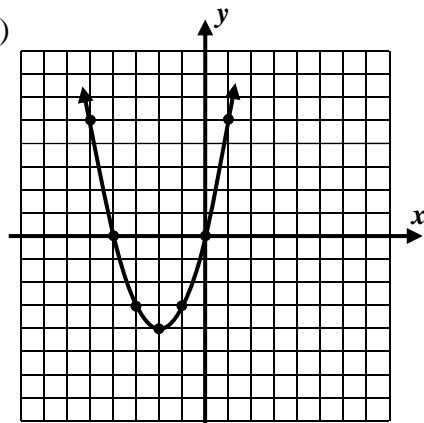
(2)  $y = -(x + 3)^2 + 4$                       (4)  $y = (-x - 3)^2 - 4$

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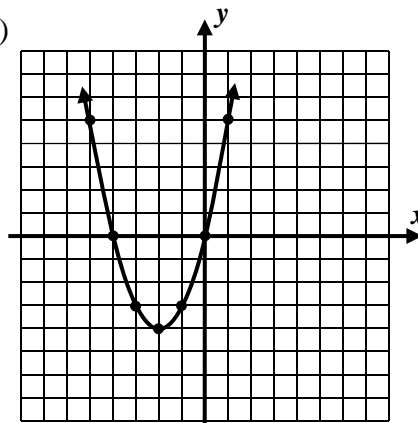


8. The graph of  $f(x) = x^2 + 4x$  is shown below on two separate grids. Give an equation and sketch a graph for the functions (a)  $f(-x)$  and (b)  $-f(x)$ .

(a)



(b)



## REASONING

9. If  $h(x)$  represents a parabola whose turning point is at  $(-3, 7)$  and the function  $f$  is defined by  $f(x) = -h(x + 2)$ , then what are the coordinates of the turning point of  $f$ ? Explain your reasoning.